



CITY OF CONCORD

REPORT TO THE MAYOR AND CITY COUNCIL

FROM: David Gill, Parks and Recreation Director
DATE: December 23, 2025
SUBJECT: White Park Pond Restoration

Recommendation:

Accept this report.

Discussion

White Park was conveyed to the City by Armenia White in 1884, in memory of her husband Nathaniel. Mr. White, a founder of The American Express Company, was a prominent businessman, legislator, and philanthropist. The White Park Pond has been a fixture at the park since the parks beginning in the late 1800's. In 1895 the city started to maintain the pond during the winter months for public ice skating. The water in the pond was even used as a drinking source however in 1910 analysis of the water was made by the state chemist and proved to be unfit for drinking, so its use as a drinking source was discontinued.

The last time the pond was renovated was between 1984 and 1986. The pond was filled with sand and gravel under a "White Park Pond Cleaning Contract." This project reduced the depth of the pond from an estimated 10 feet to around 3-4 feet on average. The northwestern corner of the pond was not filled with sand and gravel due to softer sediments which impeded equipment at the time. The cost of the project was funded by donations from the Concord Women's Club and a Land and Water Conservation Grant.



The first picture of White Park Pond was 1899, second picture is from 1897

In the FY22 CIP#51 budget, there was \$210,000 approved to dredge and clean up the west end of the pond that was not previously dredged in the mid 1980's and removal of the sediment on bottom of pond. Dredging was scheduled to remove approximately 4 feet of material on western end of the pond.

However, with the explosion of the Lotus plant we needed to step back from the original goal and look at an overall pond restoration project, one that looks at the immediate need to remove the Lotus plant, as well as the dredging of the area that was not completed in the 1980's and improving the overall water quality of the pond.

The Lotus is the primary plant genus of concern within the pond at this time. There are two species of water Lotus known to exist in North America. Nelumbo American and Nelumbo Asian are native to the southeast United States, Central America, and the Caribbean. Both are not native to New England States and in Connecticut is listed as potentially invasive and prohibited under Connecticut General Statute. Neither species are currently listed by NHDES as an exotic aquatic species in New Hampshire. Due to the invasive growth habit of both species, the pond is at risk to become overgrown with Lotus if left uncontrolled.

A lone plant with large flower was first seen in 2018 and as of July 2022 the newly identified Lotus Plant had spread to cover approximately 50% of the pond's surface area. The Lotus plant is invasive in NH and to the White Park Pond and if untreated would have taken over the pond in a couple of years. Although we do not know for sure we assume the Lotus plant, like the Koi fish in the pond was placed there by someone.



In the late fall of 2021 (FY22), we hired Solitude Lake Management to perform a mechanical harvest and remove the Lotus plant. This cutting took place in December 2021 and did not kill the plant, only removed the plant material to ensure there was the ability to have safe ice during the winter months. If we did not harvest the plant prior to winter the stems of the plant would allow weak ice to form and may have prevented us from maintaining the pond for winter ice skating.



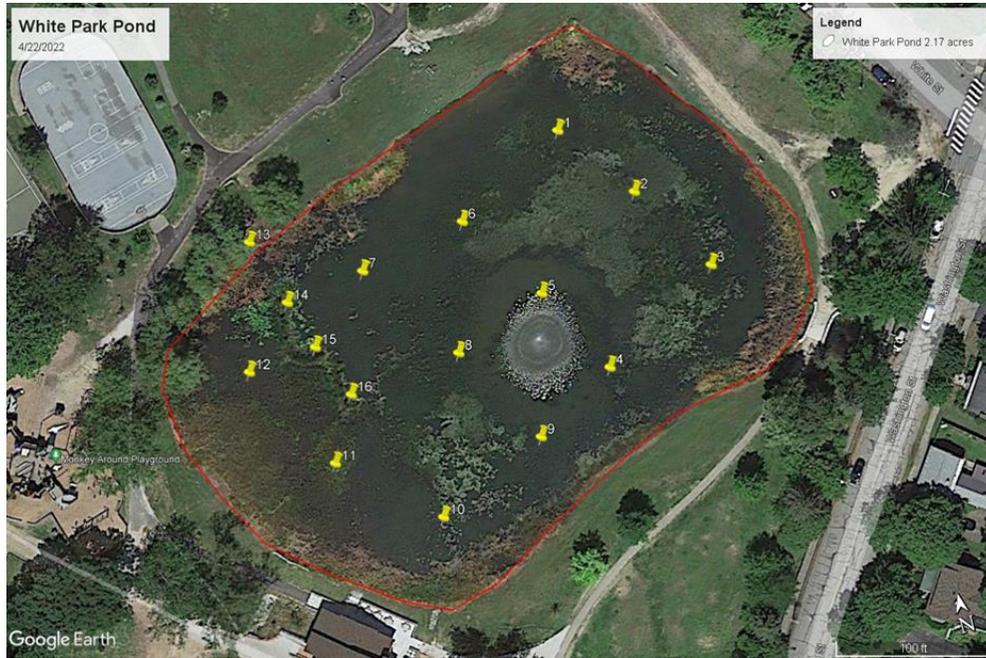
Controlling the spread of Lotus is not only necessary for the ecological health of native species and habitats within White Park Pond but is also an urgent concern for potential spread to other water bodies in New Hampshire and throughout New England. Every state in New England has at least one group within a public agency dedicated to the identification, prevention, and control of nonnative and invasive species. Eradicating the Lotus from White Park Pond should be considered a priority of regional importance. To date, the New Hampshire Department of Environmental Services (NHDES) has not listed Lotus as an invasive species which is present within the state.

Water Quality and Sediment Depth

Water quality in White Park Pond has not been continuously monitored. On April 22, 2022, VHB and DK Water Resource Company (DKWRC) collected water quality samples from the pond surface and from the northern inlet, which serves as the outlet of a storm drain. Total phosphorus concentrations were reported as 31.8 ppb ($\mu\text{g/L}$) in the center of the pond and 54.8 ppb ($\mu\text{g/L}$) at the northern inlet. The in-pond phosphorus concentration is more than sufficient to support a large biomass of rooted aquatic plants and algal growth.

Sediment depth throughout much of the pond was found to be minimal, with the exception of the northwest corner. Sediment depth was estimated by inserting steel rods into the substrate until refusal. The northwest corner of the pond contained approximately five feet of sediment, while the remainder of the pond averaged less than six inches, with depths ranging from zero to 18 inches at various locations.

An aerial overlay of the pond is shown in Figure 1. Table 1 presents sediment depth data collected by VHB and DKWRC in April 2022, with station numbers corresponding to the identified sampling locations.



**Table 1 Sediment Depth Field Data
April 2022**

Station	Water Depth (ft-in)	Sediment Depth (ft-in)
1	3' 3"	0' 2"
2	3' 3"	0' 6"
3	3' 11"	0' 8"
4	3' 3"	0' 0"
5	3' 3"	0' 0"
6	3' 3"	1' 0"
7	3' 7"	1' 6"
8	3' 3"	0' 10"
9	3' 7"	0' 3"
10	3' 3"	0' 3"
11	1' 8"	0' 1"
12	1' 4"	0' 4"
13*	-	-
14	1' 4"	5' 0"
15	3' 0"	5' 0"
16	3' 3"	5' 0"

* Note: Only water quality data collected at station 13 from stormwater inlet

Pond Management (2022–2026)

Over the past four years (2022–2025), pond management efforts have focused on mechanical harvesting to limit further establishment and spread of Sacred Lotus. Mechanical harvesting was conducted annually in mid-summer to prevent seed formation and again in October. Harvesting is performed using a sickle-bar cutter and conveyor system mounted on a floating barge.

While mechanical harvesting does not eradicate the Lotus, it has provided short-term control and limited expansion. Over the four-year period, a reduction in both the size and number of lotus plants within the pond has been observed. Our plan is to mechanical harvest the pond again in mid-summer (2026).



In collaboration with VHB, DK Water Resource Company, and the State of New Hampshire, a full dry dredge has been identified as the most effective long-term restoration strategy. All required permits for dry dredging are currently in place. Due to the high cost, however, alternative lower-cost option should be evaluated.

The objectives of restoration include improving water quality, removing Sacred Lotus roots, rhizomes, and seeds, and addressing areas of the pond not dredged during restoration efforts in the 1980s. Given the long dormancy potential of Sacred Lotus seeds, an updated long-term maintenance and monitoring plan is essential regardless of the restoration method selected.

Removal of Nonnative Koi Fish

For either restoration option, removal of nonnative Koi fish is recommended to improve water quality. Koi are bottom feeders that disturb sediments, re-suspending nutrients into the water column. In White Park Pond, this behavior contributes to elevated nutrient levels while also reducing native aquatic vegetation that would otherwise absorb dissolved nutrients. This nutrient availability can promote nuisance algal growth, including potentially toxic cyanobacteria.

Additionally, the public should be encouraged to release large bass caught while fishing. A balanced aquatic food web that includes mature predatory fish supports healthy zooplankton populations. Zooplankton consume phytoplankton, including algae and cyanobacteria, and therefore play a key role in reducing the likelihood of harmful algal blooms.

Option 1: Dry Dredge:

The complexity, cost, and efficacy of a dredging program will largely depend on what extent the pond's water level being completely lowered. If the water level can be fully lowered (or pumped out) to expose and dry most bottom sediment, a "dry" excavation will provide better long-term effects however initial cost is much higher than Option 2: Hydro Raking.

A dry dredge is expected to provide the greatest assurance for the removal of Sacred Lotus biomass while also limiting the suspension of sediment and dissolved nutrients in the water column as opposed to alternatives. Washed, clean sand fill should also be placed in the northwest corner of the pond to replace excavated material and prevent germination of any lotus seeds embedded in deeper sediments.

For this option the dry dredged is recommended to take two phases, with approximately one half of the pond remaining flooded while the other half is dried and dredged. Once one half of the pond has been dredged, it would then be flooded with water from the wet half of the pond, and the other half of the pond then dried and dredged. This could be achieved through the use of cofferdams or sandbags to bisect the pond, then relocate fish, wildlife, and water from one half of the pond to the other, while removing Koi. The process would be repeated for the second half of the pond. First phase would be the main area of lotus plant growth and area not dredged in the 1980s.

The estimate that approximately 6 to 12 inches of sediments in 30% of the pond and estimated 36 inches of sediment in another 30% of the pond would need to be excavated from the pond to provide the greatest assurance that roots, rhizomes, and seeds of the Sacred Lotus are removed. Perhaps the greatest unknown affecting the projected costs will be the extent that Sacred Lotus roots and rhizomes have spread within the sediments, determining how deeply sediment needs to be excavated in order to remove all biomass. The full extent and depth of the roots and rhizomes is unknown and that is reflected in the cost range. Depending on the depth or the roots and rhizomes the ponds depth may be increased.

Since a full dredge will take several months to complete it may impact the ability for the pond's water to refill naturally prior to winter months and then potentially impact our ability to maintain the pond for ice skating. This would be the winter following the dredge. Ideally work would start in late spring or early summer and will have negative effects for park users and the general neighborhood as the removed organic material will produce strong odors, particularly under warmer months. At this time, we do not have a firm cost to move the fish from one side of the dam to the other and remove the Koi fish, however we are carrying ample funds in the contingency at this stage.

<i>Option 1: Full Dredge</i>	Low	High
VHB/Engineering Support	\$45,000	\$45,000
Certified Wetland Specialist (required by permit)	\$35,000	\$35,000
Construction – dewatering, dredge, coffer dam, washed/clean sand fill	\$258,200	\$358,200
Material Removal: combo of organic and any base material Ranges from \$30 to \$65 cu yard, (Estimate is 5,000 cu removed)		
at \$30 per cubic yard	\$150,000	
at \$65 per cubic yard		\$325,000
Estimate	\$488,200	\$763,200
Construction Manager at 10%	\$48,820	\$76,320
Contingency at 15%	\$73,230	\$114,480
<u>Total Project Cost Option 1:</u>	<u>\$610,250</u>	<u>\$954,000</u>

Option 2: Hydro raking:

The hydro-rake system was originally created to mechanically remove invasive/nuisance aquatic plant growth with its root system and remove accumulated unconsolidated organics, debris, and leaf litter to maintain/restore water quality, water depth, and water flow without the displacement of water and impact to aquatic life. This process is done with water in the pond and using a barge like boat would remove sediment and Lotus plant and most of the materials from the area that was not dredged prior. Hydro-raking describes the process of removing pond sediment and vegetation with a small backhoe on top of a floating barge. An operator navigates around a pond from a cabin on the barge and excavates sediment and vegetation from the bottom, disposing the sediment on the pond's banks for removal. Hydro raking is best done on small ponds like White Park with water depth less than ten feet.

Advantages of hydro-raking include less equipment mobilization than a dry dredge, less impacted area around the pond due to smaller equipment, shorter material dewatering time, does not alter the ponds bottom and has lower expense.

Hydro-raking introduces some complications. Raking or excavating bottom sediments from the water's surface would cause significant turbidity. As the hydro-raking equipment is mounted on a floating barge, pond water levels cannot be lowered. This increases the pond area which would experience turbidity and nutrient re-suspension from sediments. Further, hydro-raking would very likely cut some of the lotus roots and rhizomes into fragments which could settle to the bottom of the pond.

Option 2: Hydro Raking

VHB/Engineering Support	\$15,000
Certified Wetland Specialist (required with state permit)	\$10,000
Construction – hydro rake pond, move material to drying area	\$94,000
Material Removal – all organic material At \$30 cu yard, (Estimate is 1,200 cu removed)	\$36,000
Estimate	\$155,000
Construction Manager at 10%	\$15,500
Contingency at 15%	\$23,250
<u>Total Project Cost Option 2:</u>	<u>\$193,750</u>

For both options, should new plant growth appear after work is complete a licensed aquatic specialist should be hired to chemically spot treat any plant growth. This will most likely be needed annually for two to three years post work.

Both options require the pond material that is removed to dry on site prior to removal. The full dredge will require 5,000 (+/-) cubic yards to be removed while the hydro raking estimate is 1,200 yards (+/-). We plan to store and dry the material in the park prior to trucking offsite.

Enhanced Pond Maintenance Program

For both options it is recommended we improve our stormwater treatment, add a floating wetland system and be ready to quickly address any new lotus plant growth. This would require a future budget request for \$190,000 (if funded as a FY27 project ideally the \$190,000 would be FY28 CIP request).

Install Floating Treatment Wetland System: Installation of a floating treatment wetland system. These systems provide water quality treatment through floating mats of wetland plant species at the water's surface. Plant roots then grow into the water column and uptake nutrients, reducing the nutrients available within the water body for nuisance algal growth. A system such as this may be uniquely suited to White Park as the entire system can be removed seasonally, allowing for winter recreation on the pond while providing water quality treatment during the growing season. Floating treatment wetland systems need to cover approximately 10 – 30% of the pond's surface area to provide adequate water quality treatment. To reduce the opportunity for algae growth, this installation should occur as soon as possible in the next growing season after pond restoration is completed.

Stormwater Treatment BMPs: Develop a stormwater treatment Best Management Practices (BMPs) for White Park to collect and treat runoff before it reaches the pond. Stormwater treatment should focus on removing phosphorus and suspended sediments which may include installation of bio infiltration basins such as rain gardens. An example is the Liberty Street Storm Water Drain that drains directly into the park where the water flows into a catch basin in the park that drains directly into the pond.

Remove any new lotus plants. Seeds from the lotus plant can remain dormant for years and it will be extremely important to continue to train staff on how to identify new growth and how to manually remove the plants and roots as soon as possible/as able. It is recommended for any new plant growth after work is complete is to hire a licensed aquatic specialist to chemically spot treat any new lotus plant growth. This will most likely be needed annually for two to three years post work.

Recommendation

We are currently permitted by the State of New Hampshire for the full dry dredge option. This option provides the greatest opportunity to remove Sacred Lotus biomass, including roots and seeds and pond sediment it does not guarantee complete eradication. However, a full dredge is significantly more expensive and represents a substantially larger and more complex project compared to hydro raking. While the full dredge option offers the greatest opportunity for removal, it is important to note that complete eradication is not guaranteed and the process is more expensive and complex

By accepting this report City staff will work with the State of New Hampshire to explore updating the existing permit to allow for hydro raking as an alternative restoration approach.